Description

Rotor spinning machine

The invention relates to a rotor spinning machine according to the preamble of claim 1.

In the production of yarn, a uniformity of the yarn which is as high as possible is generally aimed for within narrow tolerances. In contrast, the non-uniformity of the yarn is characteristic of effect yarns. A yarn, in which thick locations with predetermined larger diameters and with predetermined lengths, the so-called effects, are present, is called an effect yarn. The yarn sections located in between with a smaller diameter are called webs. Effect yarns are becoming more and more important. Areas of application are, for example, denims, materials for casual clothing and home textiles.

Effect yarns can also be produced on rotor spinning machines. In order to produce effects in the yarn on rotor spinning machines, the fibre feed to the opening roller of the rotor spinning device is changed, for example, in that the speed of the take-in rollers is varied. Mechanical gearings, which drive shafts which extend along the length of the machine, are activated for this purpose. The draw-in rollers are made to rotate by means of these shafts. However, due to the large mass of the moved parts of a drive system of this type and the gearing play, a precise and abrupt change in the yarn thickness cannot be achieved, or only with difficulty, at the beginning and end of an effect. The speed during spinning of

effect yarn optionally has to be sharply reduced compared to the speed when spinning effect-free yarn.

The generic DE 44 04 503 A1 describes a rotor spinning machine, in which each draw-in roller with its drive shaft is directly connected to an associated stepping motor. Each stepping motor can be activated via an activation unit. Random speed changes of the fibre band draw-in can be generated with a random generator. An effect yarn with predetermined effects cannot be produced with this known rotor spinning machine.

In order to set up a rotor spinning machine in such a way that it is possible to produce effect yarn with predetermined properties of the effects, a substantially outlay with corresponding costs for control devices and optionally also for the drives is necessary. For costs reasons, an outlay of this type is dispensed with in new rotor spinning machines, if the intention is not to spin effect yarn at the time of purchasing the machine. Thus, until now, only a small proportion of rotor spinning machines corresponding to the production proportion of effect yarn in the overall production of yarn has been equipped for the production of effect yarn. Since, in taking up the production of effect yarn, instead of new machines, it is often desired for economic reasons to use existing rotor spinning machines, which are however not accordingly equipped, and high costs are incurred for retrofitting. Control devices, which are adequate for controlling the production of effect-free yarn, are also not in a position to assist the production of effect yarn.

The object of the invention is to reduce the drawbacks described above in setting up a rotor spinning machine for the production of effect yarn.

This object is achieved with a rotor spinning machine with the features of claim 1.

Advantageous developments of the invention are the subject of the sub-claims.

With a rotor spinning machine according to claim 1, rapid, economic retrofitting of a rotor spinning machine for the production of effect yarn with predetermined effects is possible. The change to batches with other effects can easily be carried out in rotor spinning machines according to the invention by reading the effects into the central control and transmitting the data required via a data bus system to the control card. A change of the control card is not necessary for this purpose.

The control cards in each case control a plurality of spinning stations, without the production of effects being impaired by the quantity of the data to be transmitted, as could occur in the activation of all individual drives of the draw-in rollers of a rotor spinning machine from a standard control device. It is particularly favourable here if a control device in each case controls a section of the rotor spinning machine formed from a group of spinning stations. An allocation of the spinning stations, which in each case belong to a group, to one machine side of the rotor spinning machine facilitates the supply and removal of the fibre band cans and the finished

yarn. On one machine side, effect yarn can be spun and on the other machine side flat yarn may be spun simultaneously.

In a rotor spinning machine according to claim 5, after connection of the control card during the change from the production of effect yarn to the production of effect-free yarn and vice versa, no change of the control card is necessary, but rather the change in production may take place by a simple control command to the control card.

The rotor spinning machine according to the invention allows a rapid, simple and economical setting up for the production of effect yarn with a problem-free change of batch. The arrangement of the control card on the control device for a section of the rotor spinning machine allows the change in the yarn between webs and effects to be carried out in a precisely controlled manner even at high yarn speeds. The single-motor drive of the draw-in rollers avoids the disadvantages of gearings, which consist in delays in the implementation of the control commands and an increased energy output due to energy losses in the gearings.

Further details of the invention can be seen in the figures, in which:

Fig. 1 shows a schematic view of a spinning station,

Fig. 2 shows the opening device of a spinning station in a simplified schematic view, in partial view,

Fig. 3 shows a basic view of the control of draw-in rollers of a rotor spinning machine.

From the plurality of spinning stations of a rotor spinning machine, a single spinning station 1 is shown in side view. At the spinning station 1, a fibre band 3 is drawn from a fibre band can 2 through a so-called compressor 4 into the spinning box 5 of the rotor spinning device. The device arranged in the spinning box 5 for separating the fibres and feeding them into the spinning rotor 6, are known from the prior art and therefore not described in more detail. The drive of the spinning rotor 6 is indicated and consists of a belt 7 extending along the machine, with which all the rotors of the spinning stations installed on a longitudinal side of the spinning machine are driven. Alternatively, single drives for the rotors are also possible, however. The belt 7 lies on the rotor shaft 8 of the spinning rotor 6.

The thread 9 is formed in the spinning rotor 6 and is drawn off through the thread draw-off tube 10 by means of the draw-off rollers 11. The thread 9 then passes a sensor 12, the so-called cleaner, for quality monitoring of the thread. The thread 9 is guided by a thread guide 14 in such a way that it is wound onto a cross-wound bobbin 15 in cross-wound layers. The cross-wound bobbin 15 is carried by a bobbin holder 16, which is pivotably mounted on the machine frame. The cross-wound bobbin 15 rests with its periphery on the winding drum 17 and is driven thereby such that the thread 9, in cooperation with the thread guide 14 is wound in cross-wound layers. The rotational directions of the cross-wound bobbin 15 and the winding drum 17 are indicated by arrows. The sensor 12 is connected to a local control unit 20 of the spinning station via the line 18. The control unit 20 is connected to a central computer 37 of the rotor spinning machine via the line

21. The stepping motor 23 of the draw-in rollers is connected to the control device 38 via the line 24.

Fig. 2 shows details of the opening of the fibre band 3 into individual fibres. The fibre band 3 drawn in by the compressor 4 is clamped between the clamping table 26 and the draw-in roller 27 and presented to the rapidly rotating opening roller 28. The draw-in roller 27 is connected to the stepping motor 23 via the drive connection 29. The stepping motor 23 can be activated by the line 24. The rotational direction of the opening roller 28 is indicated by the arrow 30.

The basic construction of the drawn-in roller control according to the invention is shown schematically in Fig. 3.

This data is transmitted to a yarn design unit 32 by a unit 31 for generating data, which characterises a specific effect yarn. The transmission is indicated by the arrow 33. In the yarn design unit 32, the data required for spinning on a rotor spinning machine is generated by means of yarn design software. This data includes both the direct effect-related data which varies with the changing diameter of the yarn and also further data relating to the basic adjustment of the rotor spinning machine. This is, for example, the rotor, draw-off roller and opening roller speed and the selection of the spinning means. While the latter can be preferably retrieved from a table, the speeds have to be determined by corresponding algorithms. These algorithms are based on known connections. This involves, for example, the determination of the drawing from the ratio of the speeds of the take-off rollers to the speed of the draw-in rollers or the rotations

per metre from the rotor speed to the draw-off speed and the constriction of the fibre assembly connected therewith.

The data generated in the yarn design unit 32 is transmitted via the data bus system 34 to a central control device 35 of the rotor spinning machine. Transmission may also alternatively take place with transportable data carriers, such as, for example a compact flash card.

The central control device 35 is connected to the central computer 37 via the data line 36. The control device 38 comprises the control of two groups of, in each case, 12 stepping motors 23 of the respective draw-in rollers 27 via lines 24. All 24 spinning stations are constructed in the same manner. A control card 40 is connected on the control device 38 by means of the connection mechanism 39. The data for the control of the stepping motors 23, required for the production of the effect yarn, is transmitted by the central control device 35 via the data bus system 41 to the control card 40. The control card 40, for the production of effect yarn, converts the data about thickness and length of the effects and the webs, with adaptation to the other spinning adjustments, into control data for the stepping motors 23 to produce the rotary movement of the draw-in rollers 27.

The large data quantities required can be transferred very rapidly with a data bus system. Suitable data bus systems have been developed for the requirements of automated systems. The data required to control the stepping motors of the draw-in rollers is transmitted to further control cards, not shown, which are connected to control devices of further sections of the rotor spinning machine via the data bus system 42, as a

continuation of the data bus system 41. One of the further control devices is shown by dashed lines. The further control devices are constructed like the control device 38 and have the same connection mechanism and the same connected control card. Each further control device in each case controls the spinning stations of a section of the rotor spinning machine formed from two groups each with 12 spinning stations.

If the stepping motor 23 is activated in such a way that it runs more quickly, the draw-in roller 27 transports more fibre material to the opening roller 28. This results in the fact that more fibre material arrives, per time unit, in the rotor 6 and the fibre spun becomes thicker. The length of the thick location depends on the duration of the increased fibre supply. The diameter of the thick location depends on the speed of the stepping motor 23 or the draw-in roller 27.

The control device 38 is activated by the central computer 37 via the line 43 when it is specified via control commands as to whether the control device 38 alternatively controls the production of effect yarn or the production of effect-free yarn. With the control of 24 spinning stations by the control device 38, compared to control of all spinning stations directly by the central computer 37, an inertia in the control of the draw-in rollers is avoided, which may occur due to delays in the data transmission. On the other hand, the number of control devices 38 required for a rotor spinning machine together with a control card 40, is limited and the outlay for construction is thus kept within an economical framework.

The retrofitting of a rotor spinning machine which is set up initially only for the production of effect-free yarn, into a

machine, with which effect yarn can be produced, can be easily implemented. The connection mechanism can be designed as a plug mechanism and the control device 38 and the control card 40 can be configured as conductor cards. For the switching over of effect-free yarn to effect yarn in the case of a batch change, no manual intervention is necessary to exchange control cards 40 but rather the change takes place, as described above, by means of a control command of the central computer 37.

The invention is not limited to the embodiment shown. Alternative embodiments are possible within the scope of the concept of the invention.